

Fig. 3. *Petrosia testudinaria*, from the Straits of Malacca. Registered 83. 11. 8. 28 in the British Museum collection.

[All three figures are from photographs taken by Mr. Gepp from specimens in the British Museum, and they are all very much reduced.]

PLATE IV.

- Fig. 4. Spicules of *Rhaphidophlus spiculosus* (drawn under Zeiss E, Ocular 2, Camera). *a, b, c*, large tylostylote; *d, e*, small spined tylostylote.
- Fig. 5. Spicules of *Hymeniacidon? fatida* (drawn under Zeiss C, Ocular 2, Camera). *a*, small stylote; *b*, large oxete.
- Fig. 6. Spicules of *Acauthella Carteri* (drawn under Zeiss C, Ocular 2, Camera). *a*, oxete; *b, c, e*, stylote; *d*, strongylote.
- Fig. 7. Spicules of *Gelliodes carnosa* (drawn under Zeiss E, Ocular 2, Camera). *a, b*, oxete; *c*, sigmata.
- Fig. 8. Spicules of *Clathria corallitincta* (drawn under Zeiss E, Ocular 2, Camera). *a, b, c*, stylote; *d*, spined tylostylote.
- Fig. 9. Spicules of *Reniera madrepora* (drawn under Zeiss C, Ocular 2, Camera). *a, b, c*, oxete; *d*, stylote (abnormal).
- Fig. 10. Spicules of *Clathria indica* (drawn under Zeiss E, Ocular 2, Camera). *a, b*, tylostylote, verging upon unequal-ended oxete; *c*, spined stylote.

PLATE V.

- Fig. 11. *Axinella tubulata*, section taken at right angles to the surface, showing tubes of the commensal Annelid. *a*, tube with worm in it; *b, c*, empty tubes.
- Fig. 12. Spicules of *Axinella labyrinthica* (drawn under Zeiss C, Ocular 2, Camera). *a*, strongylote; *b, c*, stylote.
- Fig. 13. Spicules of *Auletta aurantiaca* (drawn under Zeiss C, Ocular 2, Camera). *a, b, d*, stylote; *c, e*, oxete.

X.—On a new British Species of *Microciona*, Bk., in which the ends of the Tricurvate are Spiniferous &c. By H. J. CARTER, F.R.S. &c., and R. HOPE, F.Z.S.

[Plate VI.]

§ 1. By MR. CARTER.

THIS species was conjecturally referred by me to *Microciona armata*, Bk. ('Annals,' 1874, vol. xiv. pp. 456, 457), on the supposition that the spiniferous character of the ends of the tricurvate spicules had been overlooked by Bowerbank. I now find I was mistaken, on which account it has probably hitherto failed to be considered a distinct species, and therefore has been

unrecognized by those who have written on the *Spongida* since that time, as lately proved by a specimen brought to my notice by Mr. Robert Hope, F.Z.S., of Cumberland Terrace, London, and which he found at Hastings. So convinced am I now by his preparations and arguments of the desirability of giving this British form of *Microciona* possessing a tricurvate with spiniferous extremities a distinct name and description, that I have much pleasure in joining him in thus publicly correcting the misconception and supplying the deficiency above mentioned.

It is not pretended that the presence of a tricurvate with spined extremities in *Microciona* is a peculiarity, for the form was described and delineated by the late Oscar Schmidt in 1870 as forming part of the spiculation of a species of *Suberites*, which he therefore called *Suberites arciger*. The specimen was very small, not being more than 4 centimetres in diameter, and came from the coast of Greenland ('Grundzüge atlant. Spong.-Faun.' p. 47, Taf. v. fig. 6).

The next delineation and description of this form of tricurvate was published by myself in 1876 as a part of the spiculation of a species of *Dictyocylindrus*, Bk., which I called *D. abyssorum*. The specimen, which was dendriform and branched, came from the Atlantic Ocean between the north of Scotland and the Faröe Islands, and was about $3\frac{1}{2}$ inches high ("Deep-sea Sponges and their Spicules, dredged by H.M.S. 'Porcupine,'" 'Annals,' 1876, vol. xviii. p. 232, pls. xii. and xv. figs. 3 and 25 respectively).

In 1874 also Dr. Bowerbank illustrated and described a species of *Isodictya* under the name of *I. coriacea* (Mon. Brit. Spong. vol. iii. pl. lxxvi. figs. 7-12, p. 228), in which this form of tricurvate was present; but he failed to notice the spined extremities, as may be seen by Mr. Stuart Ridley's emended description of the *same specimen* (now in the British Museum) under the name of *Dirrhopalum coriaceum* (Journ. Linn. Soc., Zoology, vol. xv. p. 481, pl. xxix. figs. 3-7), an example of which I also found here (Budleigh-Salterton, S. Devon) several years ago, even before Dr. Bowerbank's description (*l. c.*) was published, growing on the surface of *Stelletta aspera* in a cake-like form about an inch in diameter and half an inch thick in the centre, as the specimen which I still possess shows. To this sponge now Messrs. Ridley and Dendy have very properly given Schmidt's generic name *Plocamia* ('Challenger' Report, 1887, p. 158, pl. xxix. fig. 9 and pl. xxxi. fig. 1).

In 1874 I described the specimen of *Microciona* possessing the tricurvate with spined extremities to which I have alluded

at the commencement of this paper ('Annals,' vol. xiv. p. 456 &c.; for an illustration of the spined extremity &c. see *ib.* pl. xxi. fig. 27, *d*).

And in 1880-81 Vosmaer instituted a new genus, under the name of *Artemisina*, for a sponge that was brought from the seas about Spitzbergen by the 'Willem Barents' 2nd Expedition, which he named *A. suberitoides* (Bronn's Klass. u. Ordn. "Porifera," p. 351, Taf. xxvii. fig. 10), and which possessed a tricurvate with spined extremities. Also another under the generic name of *Amphilectus*, in the Leyden Museum, which, possessing the tricurvate, but *not* with spined extremities, he identified with *Microciona armata*, Bk. = *Scopalina toxotes*, O. S. (*ib.* p. 353, Taf. xvi. fig. 41). Thus *Amphilectus*, Vosmaer, is identified with Bowerbank's *Microciona*.

Finally, in 1887 Messrs. S. Ridley and Dendy's Report on the Monaxonida dredged by H.M.S. 'Challenger' was published, and in this three sponges have been described, viz. *Amphilectus apollinis*, *Rhaphidophylus lobatus*, var. *horrída*, and *Plocamia coriacea*, var. *elegans*, each of which possesses a tricurvate (*toxite*, R. & D.) with spined extremities, as illustrated in their plate xix. fig. 3 *b* and pl. xxix. fig. 4 *b*, respectively, for the first two, the last having only been described in the text (*op. cit.* p. 158). The only difference of any consequence between *Isodictya coriacea*, Bk. (1874), and the var. *elegans* of Ridley and Dendy appears to me to be in the adult form, that is in the manner of growth, Bowerbank's specimen and my own being massive, while the 'Challenger' variety is dendriform and branched (pl. xxxi. fig. 1).

Thus the tricurvate with spined extremities *alone* in *Microciona* is of no specific value; but when combined with other characters will be found to constitute a distinct species, as will be seen from the following description by Mr. Hope.

§ 2. By MR. HOPE.

Microciona spinarcus, n. sp. Crtr. (Pl. VI. figs. 1-6.)

The sponge alluded to by Mr. Carter in the preceding remarks on the prevalence of the tricurvate (*toxite*, R. & D.) with spined extremities was obtained by me in the month of February of the present year (1888) on the "Stade" at Hastings among the heaps of scallops piled up there as they are landed from the fishing-boats of the town.

It coats very nearly the whole fragment, about 25 millim.

long and of breadth varying from about 10 to 20 millim., of a dead shell of a small species of *Pecten* (?), itself with other objects entangled in threads of byssus, and thereby attached to a scallop. The sponge was dry when first observed and for the most part incrustated with an even layer of very fine dirt. The presence of some foraminiferal shells on the surface of this layer seems to point, though somewhat doubtfully, to its having been deposited in the sea; but I do not think it has any organic connexion with the sponge on which it lies, interfering very materially with the examination thereof. It is, indeed, somewhat uncertain if the sponge extends under the whole of the crust; but wherever this latter has been microscopically examined spicules have been found.

In places where this crust is absent, the sponge presents the appearance of an exceedingly thin colourless film, closely adhering to the ridges and furrows of the shell or connecting by a smooth erect veil the projecting teeth or processes with which the shell is furnished. Under the dirt-crust the film probably lies evenly on the ridges, bridging over the furrows, as it also does in places at the edge of the crust. The basal film, where it is exposed, bristles with upright, generally solitary spicules; probably in this place the sponge was extending its borders, for wherever the dermal membrane is well developed it appears as a glistening mat of spicules, only slightly hispid through the occasional penetration of single upright spicules from beneath.

On examination of a preparation under a power of about 50 diameters, the main skeleton is seen to consist of upright "scopuliform bundles" of spicules (Pl. VI. fig. A, 1), as in Mr. Carter's description, in this case somewhat sparsely distributed and of comparatively small dimensions, and replaced in parts by radiating tufts of spicules springing directly from the basal membrane. Probably these tufts may be immature columns, as pointed out by Dr. Bowerbank in the case of *Microciona atrosanguinea* (Mon. Brit. Spong. vol. ii. p. 149). In consequence of the slight development of the main compared with that of the dermal skeleton the dry aspect of the sponge is "flat and even," in marked contrast with the hispid papillæ of *M. atrosanguinea* and *M. armata*.

Measurements of the spicules, which differ considerably from those of the specimen described by Mr. Carter ('Annals,' 1874, vol. xiv. p. 457), but approach more closely to those of another specimen of which he has very kindly sent me a preparation* for comparison, are as follows, the diameter given being in all cases that of the largest spicules.

* This was found a few years ago growing over the surface of a red

Megasclera * three, viz. :—1. Long, slightly curved styles, sometimes very slightly constricted, sometimes slightly swollen above the base, and studded at the base with round tubercles or blunt spines about $\cdot 34$ to $\cdot 48$ millim. \times $\cdot 009$ millim. (fig. A, 2). 2. Entirely (but generally somewhat sparsely) spined, straight or slightly curved styles, gradually tapering, basally truncate to subtylote, varying much in size, about $\cdot 08$ to $\cdot 204$ millim. \times $\cdot 0075$ millim. (fig. A, 3). 3. Long, slender, smooth styles, slightly clavate, about $\cdot 22$ to $\cdot 308$ millim. \times $\cdot 0035$ millim. (fig. A, 4).

Microsclera two, viz. :—1. Very slender toxa, having the ends much produced and the tips sharply spined, very various in size, ranging from about $\cdot 048$ to $\cdot 29 \times \cdot 0025$ millim. (fig. A, 5). 2. Minute palmate isochelæ, palmæ subtriangular, comparatively rare, length $\cdot 008$ to $\cdot 012$ millim., average about $\cdot 0105$ millim. (fig. A, 6).

For comparison measurements are appended of the corresponding spicules of *Microciona armata*, taken from a specimen found coating red sandstone on the shore at Sidmouth, S. Devon. This sponge appears to be somewhat rare, and its occurrence on rock between tide-marks, if not previously noticed, is of some interest, the specimens mentioned by Dr. Bowerbank (Mon. Brit. Spong. vol. ii. pp. 130, 131) being on shells and apparently from deeper water.

Megasclera.—1. Stout, basally tuberculated or spined styles, mainly two sizes, with fewer intermediates, one size ranging from about $\cdot 23$ to $\cdot 35$ millim. in length, the other from about $\cdot 53$ to $\cdot 627$ millim. long; breadth in both cases about $\cdot 02$ millim. (fig. B, 2). 2. Spined styles of the very characteristic form described and figured by Dr. Bowerbank (Mon. Brit. Spong. vol. ii. pp. 129, 130, 131, and 141, and vol. iii. pl. xxiii. fig. 24), $\cdot 16$ to $\cdot 2 \times \cdot 016$ millim. at base (fig. B, 3); there are also some smaller ones only about $\cdot 008$ millim. in diameter. 3. Slender styles about $\cdot 312$ to $\cdot 428 \times \cdot 0065$ millim. (see "Note," Explanation of Pl. VI.).

Microsclera.—1. Toxa quite smooth at tips, $\cdot 022$ to $\cdot 19 \times$ about $\cdot 0025$ millim. (fig. B, 5). 2. Palmate isochelæ, abundant, generally $\cdot 013$ to $\cdot 017$ millim. in length, a very few observed $\cdot 0215$ to $\cdot 023$ millim. long (fig. B, 6).

It will be seen, from a comparison of the spicular measure-

clay-boulder about "low-water mark" in company with a variety of *Hymeniacidon Dujardini*, Bk., of a jet-black colour when fresh.—C.

* The names of the spicules are in accordance with Ridley and Dendy's nomenclature in their Report of the 'Challenger' Monaxonida, part lix. (1887).

ments of the two sponges, that :—1, while the main skeletal spicula of the former are in length intermediate between the two chief divisions of those of *M. armata*, they are little more than one third as thick; 2, the characteristic spined styles of *M. armata* are entirely absent from the sponge under consideration, being replaced by spicules approaching more nearly to the corresponding form in *M. atosanguinea*. Turning to the microsclera, we find, 1, that while none of the other spicules of our sponge attain to the dimensions of those of *M. armata*, the toxa exceed in length those of the latter sponge by fully one half, viz. $\cdot 29$ against $\cdot 19$ millim., the largest respectively; if the average be taken, the proportional difference will be found fully as great. They differ also in possessing in the one case *spined* and in the other perfectly *smooth* tips. 2. On the other hand the chelæ of this sponge are on the average only about two thirds as long as those of *M. armata* and much less numerous.

The possession of this specimen of *M. armata* enabled me to bring to the notice of Mr. Carter the differences between the two sponges, and these proved, as above stated, to be in his judgment of specific value. The points more especially relied upon in support of this view Mr. Carter leaves me to state. They are as follows:—1, the difference in the skeletal arrangement of the two forms, which is exceedingly striking on an inspection of balsam preparations, the “scopuliform bundles” of *M. spinarcus* (fig. A, 1) being weak and “unarmed,” while those of the aptly-named *M. armata* angrily bristle on all sides with their thorny styles, and recall vividly the trophies of swords and bayonets which decorate an armoury (fig. B, 1); 2, the complete absence in the former sponge of the characteristic spined style of the latter; and 3, the spination and great increase in size, both absolutely and particularly relatively, of the toxa in *M. spinarcus*. As regards the last point, the largest main skeletal spicules are to the largest toxa in length in *M. armata* as $3\cdot 3$ to 1, in *M. spinarcus* only as $1\cdot 66$ to 1. If the average of the spicules were taken, the discrepancy would be, I believe, quite as great; but where the spicules vary so very much in size, the average must be so much a matter of appreciation that it seems better to give measurements of the largest spicules, which are easily recognized.

From *M. atosanguinea* our sponge differs chiefly in the shape and spination of the main skeletal spicules and in the form, size, and spination of the toxa. Slighter divergences in the other spicula will be best appreciated by inspection of the annexed Plate VI. figs. A and C, 2–6 inclusively. The

spiculation generally is finer than in either *M. armata* or *M. atrosanguinea*, and the even flat habit in the growth of the sponge is also a point of difference from both species. The spicules of *M. atrosanguinea* figured (viz. C, 2, 3, 5, and 6) are from a Hastings specimen taken at the locality given by Dr. Bowerbank (Mon. Brit. Spong. vol. ii. p. 140).

As the sponge (*M. spinarcus*) coats a shell, it has been possible by decalcifying the latter to get a very small portion fairly undisturbed and mounted for microscopical examination. In the part thus treated I have been able to detect only one form of spicule in the "scopuliform bundles" and radiating tufts of the main skeleton, viz. the large basally tuberculated styles (fig. A, 2). The long, slender, smooth styles (fig. A, 4) lie in wisps in both the basal and dermal membranes; the toxa (fig. A, 5) have been seen in the basal film only, where they seem to be roughly arranged in lines with the ends of the component spicules overlapping; their abundance, however, makes it probable that they are to be found in other parts of the sponge also. The spined styles stand upright from the base in the intervals of the bundles and tufts, sometimes echinating the wisps of spicules. No chelæ were detected *in situ* (fig. A, 6). The piece suitable for examination is, however, so comparatively minute and the dry condition of the sponge so unfavourable that these observations are probably of no value; they are given only for what they are worth.

The generic name "*Microciona*" has been provisionally retained for the purposes of this paper for what may perhaps be denominated the typical division or group of Dr. Bowerbank's genus of that name (comprising *M. armata*, *M. atrosanguinea*, and, if the above views be allowed, *M. spinarcus*), mainly on account of the close resemblance of the spiculation of the group to that of some species of the genera *Clathria* and *Rhaphidophlus*. This seems to be a strong argument in favour of the course pursued by Mr. Carter in placing *Microciona* in his family "Ectyonida," which is given by Messrs. Ridley and Dendy as a synonym of their subfamily "Ectyoninæ" ('Challenger' Reports, "Monaxonida," p. 128). This would imply the exclusion of the group from the genus *Amphilectus*, Vosmaer, which is a member of the subfamily "Esperellinæ," Ridley and Dendy (see 'Challenger' Monaxonida, p. 123). The occurrence of the spined toxa in *M. spinarcus* somewhat strengthens the case; in *Rhaphidophlus lobatus*, for instance, each of the five different forms of spicule possessed by that sponge is represented in the "*Microciona* group" by a closely similar form ('Challenger'

Monaxonida, p. 154, pl. xxix. figs. 4, 4 *a*, 4 *b*, and 4 *c*), and its echinating spicule is almost identical with that of *M. armata*. I do not know whether Messrs. Ridley and Dendy's dictum under this species, that "there can be little doubt that these spined spicules are really homologous with the echinating spicules of allied species" (*ib.* p. 154), can be fairly and without straining applied to this "*Microciona* group;" if it can it may perhaps be inferred that these gentlemen would have included the group in the Ectyoninæ had the point arisen for their discussion. But the 'Challenger' had none of the species of it, and all the species of *Amphilectus* described by them in their Report are without spined styles.

The skeletal arrangement also of this division of *Microciona* appears to me to have considerably greater affinity with that of *Clathria* than with that of an Esperelline sponge.

I desire to express my great indebtedness to Mr. Carter for his most kind and courteous assistance and advice, including the loan of rare specimens and microscopic preparations from his own collection, also to tender my thanks to Dr. A. Günther, F.R.S., Keeper of Zoology at the Natural-History Museum, for kind advice and permission to make use of the National Collection freely accorded, as well as to Mr. R. Kirkpatrick, in temporary charge of the sponges in the Museum, for much trouble taken on my behalf.

It is proposed to deposit the specimen which has given occasion for these remarks, with microscopic preparations of the skeleton and spicules, in the Natural-History Museum.

EXPLANATION OF PLATE VI.

- A. *Microciona spinarcus*.
 B. *Microciona armata*.
 C. *Microciona atrosanguinea*.

- Fig. 1.* A scopuliform bundle of the skeleton.
Fig. 2. Main-skeletal spicules.
Fig. 3. Entirely spined styles.
Fig. 4. Long slender style.
Fig. 5. Toxites.
Fig. 6. Isochelæ.

Fig. 1 magnified 50 diams.; *figs. 2-5*, 250 diams.; *fig. 6*, 850 diams.

Note.—Spicules of the form no. 4 in *M. armata* and *M. atrosanguinea* are not figured, as they differ but slightly from those of *M. spinarcus* except in size. Those of *M. armata* are sometimes spined at the base in the axial line.